

32. (NEW) A method according to claim 1 wherein the array carries features with polynucleotides of different sequence.

33. (NEW) A method according to claim 30 wherein the array comprises peptide containing features.

REMARKS

The Examiner is thanked for the Office Action mailed 09/27/2002 (request for 1-month extension of time to respond, enclosed). Claims 1-29 are pending in the present application and stand rejected. The outstanding objections and rejections will be discussed in the sequence in which they appear in the Action.

The Examiner first noted several objections to the drawings. In particular, reference numbers 16a, 16b, 16c of FIGS. 2 and 3, and reference numbers 18 and 120 of FIG. 6 did not appear in the description. A separate letter requesting Examiner approval of the changes indicated in red to FIGS. 2, 3 and 6 is enclosed. The proposed drawing changes delete of "a", "b" and "c" from 16a-16c in FIGS. 2 and 3, and also deletes "18" and "120" from FIG. 6. The proposed drawing change further adds reference numbers 20 and 63 to FIG. 6 (which numbers were noted by the Examiner to be absent from the drawings).

35 U.S.C. 112, Second Paragraph Rejections (Indefiniteness)

The Examiner raised a number of rejections under this heading. First, on the question of what is required by 35 USC § 112, second paragraph, the Federal Circuit's discussion in Miles Laboratories Inc. v. Shandon Inc. 27 USPQ 1123 @ 1126 (Fed.Cir. 1993) is instructive:

"The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. *Orthokinetics*, 806 F.2d at 1576. If the claims read in light of the specification reasonably

apprise those skilled in the art of the scope of the invention, § 112 demands no more. *Hybritech*, 802 F.2d at 1385. The degree of precision necessary for adequate claims is a function of the nature of the subject matter. *Id.*"

Further, M.P.E.P. § 2173 outlines the same approach when considering the second paragraph of 35 USC § 112. Each of the rejections under this title will now be discussed in sequence (paragraph numbers refer to the numbered paragraphs of the Action).

Paragraph 7

In paragraph 7 of the Action the Examiner first rejected claims 1, 9, 14, 16-21, 26, 27 as unclear as to what types of "error" occur in the dispensers. The Merriam-Webster on-line dictionary (www.merriam.com) provides the following definition of "error":

"1 a : an act or condition of ignorant or imprudent deviation from a code of behavior b : an act involving an unintentional deviation from truth or accuracy c : an act that through ignorance, deficiency, or accident departs from or fails to achieve what should be done: as..." (emphasis added)

Thus, the claim language relating to an "error" in a dispenser more than "reasonably apprises" one that this represents a deviation from accuracy in the dispenser. Furthermore, examples of errors in dispensers are listed on page 17, lines 6-11 (and specifically included failure to fire on command, dispensing a drop of unsatisfactory volume, dispensing a drop at a misplaced position). Given the combination of the foregoing one is more than "reasonably apprised" of the meaning of an error in the dispenser within 35 U.S.C. 112 and this rejection should therefore be withdrawn.

Paragraph 8

In paragraph 8 of the Action the Examiner rejected claims 1, 2, 6-9, 11, 13, 14, 16, 18-21, 23, 27-29 on the basis that it was unclear as to whether "second" refers to the next adjacent dispenser in the first group and the corresponding position of the next adjacent dispenser in the second group, or the next adjacent row in the first group and the corresponding position of the next adjacent row in the second group. Claims 1 (and 2, 6-8 which are dependent thereon) has now been amended to more clearly

recite the relationship of the dispensers by including limitations from canceled claim 3 which refer to a second dispenser of the “series” (members of the series being loaded with a same fluid). Claim 14 (and 16, 18-20 which are dependent thereon) and claim 27 (claims 28, 29 which are dependent thereon) have been similarly amended. Claim 9 (and claims 11, 13 which are dependent thereon) has also been amended to more clearly recite the relationship of the dispensers by reciting that “wherein for each column of each group dispensers of a same column within a group are loaded with a same fluid” (that is, dispensers within a same column of a group are loaded with a same fluid although different columns of a group may be loaded with different fluids). Claim 21 (and claim 23 which is dependent thereon) has been similarly amended. Within the context of the amended claims, as to which dispensers of a series or which row are “second”, this is discussed in detail on page 9, line 27 to page 10, line 13. Particularly as described on page 10, lines 6-8 a second row of each group implies that when one second row is aligned to move along the selected path for its group, the other second rows are simultaneously aligned to move along the selected for their respective groups.

Given the above amendments and the description on page 9, line 27 to page 10, line 13 it is submitted that the rejected claims now at least “reasonably apprise” one of ordinary skill as to the scope of the claims. Accordingly, this rejection should now be withdrawn.

Paragraph 9

The Examiner next rejected claims 1, 14, and 27 on the basis that it was unclear whether the second dispenser of each and every group dispenses. However, claim 1 itself recites: “while dispensing droplets from **at least the second dispenser of the series of the first group**” (emphasis added). The foregoing language plainly states that “at least” the second dispenser in the first group is dispensing. This language literally recites a minimal requirement (**at least** the second dispenser dispenses) and does not prevent the second dispenser of other groups dispensing. Claims 14 and 27 also have similar language. Accordingly, it is believed this language at least “reasonably apprises” one of ordinary skill as to the scope of the claim and this rejection should therefore be withdrawn.

Paragraph 10

The Examiner rejected claims 1, 2, 8, 14, 16, 27 on the basis that it was unclear what “selected path” refers to. In particular the Examiner questioned whether the “respective paths” are the same as the “selected paths”. The Examiner also questioned whether when droplets are dispensed from at least the second dispenser of the first group in at least part of the pattern for the selected path of the first group, whether the second dispenser always follows the path of the defective dispenser. Turning first to claim 1 (claims 2 and 8 being dependent thereon) and 14 (claim 16 dependent thereon), those claims refer to a transport system such that “different dispensers in the series of each group following respective paths” (that is, the dispensers follow respective paths). Claims 1, 14 have been amended to clarify that the processor serves “to dispense droplets from dispensers in a pattern along a selected path for each group during operation of the transport system, so as to form the array”. Thus, droplets are to be dispensed along a selected path for each group and different dispensers move along respective paths. Also, when there is an error in a dispenser of a series of a first group (last paragraph of claims 1, 14) a second dispenser of the series of each of the multiple groups is moved along the selected path for its group. It is believed that the foregoing amendment to claims 1, 14 also clarifies that the “pattern” is the pattern in which droplets are dispensed.

Thus the language of claims 1, 14 now at least “reasonably apprise” one of the scope of the claim, and the present rejection should now be withdrawn. Similarly, claim 27 has similar language to what is now provided in claims 1 and 14 and the rejection of claim 27 should now be withdrawn for the same reasons as discussed in connection with amended claims 1, 14.

Paragraph 11

The Examiner next rejected claims 2, 6, 13, 16, 28 on the basis that it is unclear what the “same group” refers to. The foregoing claims have all now been amended to clarify the language and refer more particularly to the “series” or “row” in

question. Accordingly, in view of the foregoing clarifying amendments it is believed this rejection should now be withdrawn.

Paragraph 12

Claims 2, 6, 13, 16 and 28 were rejected on the ground of lack of antecedent basis for “same group” in the last line of each claim. These claims have been amended to clarify them as discussed under the preceding paragraph and the language “the same group” no longer appears. Accordingly, it is believed this rejection should now be withdrawn.

Paragraph 13

The Examiner rejected claims 3 and 4 on the basis it was unclear what “same series” referenced in these claims. As mentioned above, limitations from claim 3 have been placed in claim 1, and claim 3 has been canceled and the foregoing language in claim 4 also canceled. Accordingly, it is believed this rejection should now be withdrawn.

Paragraph 14

The Examiner rejected claims 3, 4, 12, 17, 24 for lack of antecedent basis for “same series” in the second to last line of the claims. Claim 3 has been canceled and this language deleted from claims 4 and 17. Claim 12 has been amended to refer to “a same column in a group” while claim 24 has been amended to refer to “a same column as the error dispenser”. Accordingly, it is believed these rejections should now be withdrawn.

Paragraphs 15, 16

Claims 12, 17, and 24 were rejected on the basis that it was unclear what the “same series” and “that series” reference. As already discussed, claim 17 has been amended to delete the foregoing language. Claim 12 has been amended to reference “a same column in a group as the error dispenser”, while claim 17 has been amended to clarify that “a same column as the error dispenser” is reference. Accordingly, it is believed this rejection should now be withdrawn.

Paragraph 17

The Examiner rejected claims 8, 20, 29 on the basis that “The first and second groups are moved alternately with respect to what?”. Claim 8 recites “the first and second dispensers of each group are alternately moved along the selected path for that group” (claims 20 and 29 have similar language). The Merriam-Webster on-line dictionary (www.merriam.com) provides the following primary definition of “alternate” and “alternately”:

“1 : occurring or succeeding by turns <a day of *alternate* sunshine and rain>”
“- *al·ter·nately* *adverb*”

Claim 8 states the first and second dispensers (of each group) are alternately moved “along the selected path”. Accordingly, by the dictionary definition this means they are succeeded in turns in their movement along the selected path (that is, one of them is moved along the selected path then the other). Thus, these claims more than “reasonably apprise” one of ordinary skill of the scope in relation to the use of “alternately” and accordingly the present rejection should be withdrawn.

Paragraph 18

The Examiner states that with regard to claims 9, 11-13, 21, 23-25 “columns and rows are relative”. While this may be true the basis for a rejection given this statement is not understood (the Examiner has not alleged how this somehow makes the claim scope indefinite). The Examiner is requested to either clarify this rejection or withdraw it.

Paragraph 19

The Examiner stated that in claims 11 and 23 it is unclear what “that group” refers to. Both claims 11 and 23 have now been amended to clarify that “each group” is being referenced. Accordingly, it is believed this rejection should now be withdrawn.

35 U.S.C. 103 Rejections (Obviousness)

The Examiner raised a number of rejections of the claims, the primary reference of each rejection being Hermanson (US 5,581,284), which was combined with Hickman (US 4,963,882) in view of Hubbard et al. (US 4,907,013) and/or Gamble (US 6,001,309). The only independent claims in the present application are claims 1, 9, 14, 21, and 27.

Turning to the primary reference, Hermanson, discloses a means of extending the life of a printbar such as a black ink printbar in a multi-color printbar by substituting another nozzle in another printbar carrying a different color ink (column 2, lines 15-21). In particular, cyan, magenta and/or yellow are used to substitute for black for an error printbar, or black may be used to fill in for missing cyan or magenta droplets (column 2, lines 22-28). On the other hand, claim 1 has been amended to recite that "each group comprises a series of drop dispensers within the group loaded with a same fluid". Claim 1 now further provides that "when a dispenser of the series within a first group is in error", "a second dispenser of the series of each group" is moved along the selected path for its group "while dispensing droplets from at least the second dispenser of the series of the first group in at least part of the pattern for the selected path of the first group". Since the dispensers of a series of a group are loaded with the same fluid, this necessarily means that any drop dispensing by an error dispenser in the first group is replaced with that of a dispenser dispensing the same fluid (since it is replaced by a dispenser of the same series). This is unlike Hermanson where the one color is necessarily replaced by another color. Furthermore, none of the other cited references make up for this deficiency in Hermanson (nor has the Examiner alleged they do). Note that the foregoing distinction allows chemical arrays to be fabricated by methods of the present invention in which, when there is a drop dispenser error, the exact desired chemical array can still be produced. Unlike printing an image as in Hermanson (where replacing a few pixels in an image with a "similar" color can be satisfactory for many purposes), it is not sufficient in chemical array fabrication to replace a feature which was to carry a particular chemical probe with some other chemical probe. This could lead to a complete misinterpretation of results with potentially serious consequences (for example, with an array used for diagnostic purposes the patient's condition could be incorrectly diagnosed). Accordingly, this rejection of

claim 1 (and claims 2-8 which are directly or indirectly dependent on it) should now be withdrawn.

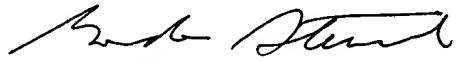
Claims 14 and 27 contain similar limitations as claim 1 and consequently the rejection of claim 14 (and dependent claims 15-20) and claim 27 (and dependent claims 28-29) should now also be withdrawn.

Claims 9 has similarly been amended to claim 1 to make it clear that for each column of each group the dispensers of a same column within a group are loaded with a same fluid. Thus, during the moving in (b) (iv) non-error dispensers in the second row of the first group can dispense the same fluid as would have been dispensed by error dispensers in the first row of the first group. This is not possible with Hermanson where a different fluid is necessarily dispensed to replace the "error" printbar. Accordingly, this rejection of claim 9 (and dependent claims 10-13) should now be withdrawn. Claim 21 contains a similar limitation and the rejection of that claim (and dependent claims 22-26) should also now be withdrawn.

The dependent claims falling under this rejection have additional elements which are believed to further distinguish over the prior art. However, in view of the above, discussion of these additional elements is not deemed necessary at this time. Note though that new claims 30-33 recite use of the methods for fabricating biopolymer arrays. None of the references disclose nor suggest use of the claimed correction technique in such fabrication.

In view of the above amendments and discussion it is believed that claims 1-2, 4-29 and new claims 30-33 are now in condition for allowance. If the Examiner is of the view that there are any outstanding issues, she is invited to call Gordon Stewart at (650)485-2386.

Respectfully submitted,



Gordon Stewart
Attorney for Applicants
Reg. No. 30,528
Tel: (650)485-2386

Jan. 27, 2003
Agilent Technologies
Legal Department, DL429
IP Administration
P.O. Box 7599
Loveland, CO 80537-0599

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APPENDIX A

1. (AMENDED) A method of fabricating a chemical array using:
a head system with multiple groups of drop dispensers which move in unison,
wherein each group having multiple dispenserscomprises a series of drop dispensers
within the group loaded with a same fluid;
a transport system to move the head system with respect to a substrate with
different dispensers in the series of eachthe groups following respective paths;
a processor to dispense droplets from dispensers in a pattern along a selected
path for each group during operation of the transport system, in a pattern along a
selected path for each group so as to form the array;
the method comprising:
 - a) identifying an error in one or more dispensers;
 - b) when a dispenser of a the series within a first group is in error, then moving a
second dispenser of the series of each group along the selected path for its group
while dispensing droplets from at least the second dispenser of the series of the first
group in at least part of the pattern for the selected path of the first group.
2. (AMENDED) A method according to claim 1 wherein in step (b) droplets are
dispensed from each second dispenser of the series within each of multiple groups in
at least part of the pattern for the selected path of the same group containing that
series.
3. A method according to claim 2 wherein:
a series of dispensers within each group is loaded with a same fluid; and
in step (b) droplets are dispensed from a non-error dispenser of the same series
as the error dispenser.
4. (AMENDED) A method according to claim 2 wherein:
a series of dispensers within a group communicate with a corresponding
common reservoir for that series; and

~~in step (b) droplets are dispensed from a non-error dispenser of the same series as the error dispenser.~~

5. A method according to claim 1 wherein the dispensers are pulse jets.
6. (AMENDED) A method according to claim 2 wherein in step (b) the droplets are dispensed from ~~at least one a~~ second dispenser of a series group in ~~at~~ the complete pattern for the first dispenser of the same series containing the second dispenser group.
7. (AMENDED) A method according to claim 2 wherein in step (b) the droplets are dispensed from at least one the second dispenser of the first group, in ~~at~~ the complete pattern for the selected path of the first group.
8. A method according to claim 2 wherein when a second dispenser of a second group is additionally in error, the first and second dispensers of each group are alternately moved along the selected path for that group while droplets are dispensed from non-error dispensers of the first and second groups in at least part of the pattern for the selected paths for the first and second groups.
9. (AMENDED) A method of fabricating a chemical array using:
~~a head system with multiple groups of drop dispensers which move in unison, each group having multiple rows and columns of dispensers wherein each group comprises multiple rows and columns of dispensers and wherein for each column of each group dispensers of a same column within a group are loaded with a same fluid;~~
a transport system to move the head system with respect to a substrate with different rows following respective paths;
a processor to dispense droplets from dispensers during operation of the transport system, in a pattern along a selected path for each group, so as to form the array;
the method comprising:
 - a) identifying for an error in one or more dispensers;

b) when dispensers of different columns within first and second rows of a first group are in error, then:

- (i) positioning the head with a first row of each group aligned with the selected path for that group;
- (ii) moving the head with respect to the substrate while dispensing droplets from non-error dispensers in the first row of the first group in accordance with a part of the pattern for the selected path for that group;
- (iii) re-positioning the head such that a second row of each group is aligned with the selected paths; and
- (iv) moving the head with respect to the substrate while dispensing droplets from non-error dispensers in the second row of the first group in accordance with a part of the pattern for that group.

10. A method according to claim 9 wherein the dispensers are pulse jets.

11. A method according to claim 9 wherein in step (b)(iv) droplets are dispensed from non-error dispensers in the second row of each of multiple groups in accordance with at least part of the pattern for that each group.

12. (TWICE AMENDED) A method according to claim 9 wherein:

a series of dispensers in each of multiple columns of each of multiple groups, wherein for each column of each group dispensers of a same column within a group are loaded with a same fluid by communicating communicates with a corresponding common reservoir for that column within the group series; and

in step (b)(iv) droplets are dispensed from a non-error dispenser of at the same column in a group series as the error dispenser.

13. (TWICE AMENDED) A method according to claim 9 wherein in step (b)(iv) droplets are dispensed from at least one second row of a group in the complete pattern for the selected path of the same group containing that second row.

14. (AMENDED) An apparatus for fabricating a chemical array, comprising:

(a) a head system with multiple groups of drop dispensers which move in unison, wherein each group having multiple drop dispensers comprises a series of drop dispensers within the group loaded with a same fluid;

(b) a transport system to move the head system with respect to a substrate with different dispensers in the series of each the groups following respective paths;

(c) a processor which:

dispenses droplets from dispensers in a pattern along a selected path for each group during operation of the transport system, in a pattern along a selected path for each group so as to form the array; and

when an error indication is identified by the processor indicating an error in a first dispenser of a-the series of the first group, then moves a second dispenser of the series of each group along the selected path for its group while dispensing droplets from at least the second dispenser of the series of the first group in at least part of the pattern for the selected path of the first group.

15. An apparatus according to claim 14 wherein the dispensers are pulse jets.

16. (TWICE AMENDED) An apparatus according to claim 14 wherein the processor, when the error indication is identified, dispenses droplets from each second dispensers of the series within each of multiple groups in at least part of the pattern for the selected path of the same group containing that series.

17. (TWICE AMENDED) An apparatus according to claim 16 wherein:

a columnseries of dispensers within a group communicate with a corresponding common reservoir for that columnseries; and

when the error indication is identified, the processor dispenses droplets from a non-error dispenser of the same series as the error dispenser.

18. (TWICE AMENDED) An apparatus according to claim 16 wherein, when the error indication is identified, the processor dispenses droplets from the at least one second dispenser of a series group in at the complete pattern for the first dispenser of selected path of the same series group.

19. (TWICE AMENDED) An apparatus according to claim 16 wherein, when the error indication is identified, the processor dispenses droplets from at least one~~the~~ second dispenser of the first group in at~~the~~ complete pattern for the selected path of the first group.

20. (TWICE AMENDED) A method according to claim 16 wherein when another error indication is identified by the processor additionally indicating an error in a dispenser of a~~the~~ second dispenser of a second group, the processor alternately moves the first and second dispensers of each group along the selected path for that group while dispensing droplets from non-error dispensers of the first and second groups in different parts of the pattern for the selected path for the first group.

21. (AMENDED) An apparatus for fabricating a chemical array, comprising:

- (a) a head system with multiple groups of drop dispensers which move in unison, each group having multiple rows and columns of dispensers; wherein each group comprises multiple rows and columns of dispensers and wherein for each column of each group dispensers of a same column within a group are loaded with a same fluid;
- (b) a transport system to move the head system with respect to a substrate with different rows following respective paths;
- (c) a processor which:
 - dispenses droplets from dispensers during operation of the transport system, in a pattern along a selected path for each group so as to form the array;
 - when an error indication is identified by the processor indicating an error in dispensers of different columns within first and second rows of a first group, then:
 - (i) positions the head with a first row of each group aligned with the selected path for that group;
 - (ii) moves the head with respect to the substrate while dispensing droplets from non-error dispensers in the first row of the first group in accordance with a part of the pattern for the selected path for that group;
 - (iii) re-positions the head such that a second row of each group is aligned with the selected paths; and

(iv) moves the head with respect to the substrate while dispensing droplets from non-error dispensers in the second row of the first group in accordance with a part of the pattern for that group.

22. An apparatus according to claim 21 wherein the dispensers are pulse jets.

23. (TWICE AMENDED) An apparatus according to claim 21 wherein in step (iv) droplets are dispensed from non-error dispensers in the second row of each of multiple groups in accordance with at least part of the pattern for each~~that~~ group.

24. (TWICE AMENDED) An apparatus according to claim 21 wherein:

for each column of each group dispensers of a same column within a group are loaded with a same fluid by communicating with a corresponding common reservoir for that column within the group ~~a series of dispensers in each of multiple columns of each of multiple groups, communicates with a corresponding common reservoir for that series;~~ and

~~in step (iv) droplets are dispensed from a non-error dispenser of at the same column series as the error dispenser.~~

25. An apparatus according to claim 21 wherein in step (iv) droplets are dispensed from at least one second row of a group in the complete pattern for the selected path of the same group.

26. An apparatus according to claim 21 additionally comprising a sensor to monitor dispensers for an error and provide corresponding data to the processor.

27. (AMENDED) A computer program product for use with an apparatus for fabricating a chemical array having:

a head system with multiple groups of drop dispensers which move in unison, ~~wherein each group having multiple dispensers comprises a series of drop dispensers within the group loaded with a same fluid;~~

a transport system to move the head system with respect to a substrate with different dispensers of the series of each groups following respective paths; and a processor;

the computer program product comprising a computer readable storage medium having a computer program stored thereon which, when loaded into the processor, performs the steps of:

- a) identifying for an error in one or more dispensers;
- b) when a dispenser of the series within a first group is in error, then moving a second dispenser of the series of each group along a selected path for its group while dispensing droplets from at least the second dispenser of the series of the first group in at least part of the pattern for the selected path of the first group.

28. (TWICE AMENDED) A computer program product according to claim 27 wherein in step (b) droplets are dispensed from each second dispenser of the series within each of multiple groups in at least part of the pattern for the selected path of the same group containing that series.

29. A computer program product according to claim 27 wherein when a dispenser of a second set of the first group is additionally identified as being in error, the program causes the first and second dispensers of each group to be alternately moved along the selected path for that group while droplets are dispensed from non-error dispensers of the first and second groups in different parts of the pattern for the selected path for the first group.

30. (NEW) A method according to claim 1 wherein the array comprises biopolymer features.

31. (NEW) A method according to claim 1 wherein the array carries polynucleotide containing features.

32. (NEW) A method according to claim 1 wherein the array carries features with polynucleotides of different sequence.

33. (NEW) A method according to claim 30 wherein the array comprises peptide containing features.